PAGE
DATE

Diode Application

① Limiter Clipping

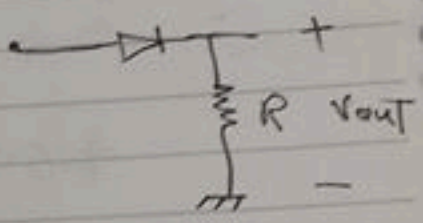
② Clamping

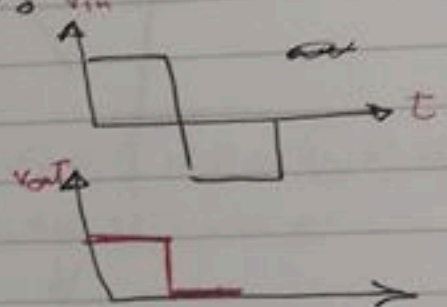
③ Voltage doublers

① * Limiter-Clipping.

(1) $V > 0$ → diode is on → $\therefore V_{out} = IR$

$V < 0$ diode is off → $V_{out} = 0$



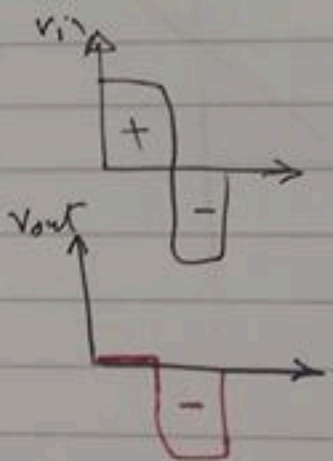


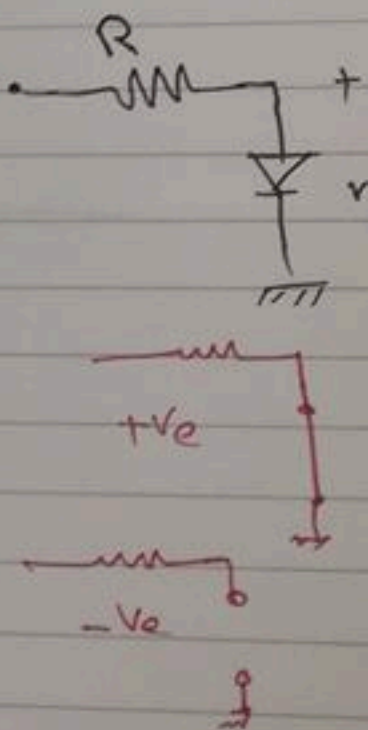
(1) +Ve half wave

$V_o = 0$

(2) −Ve half wave

$V_o = V_{in}$

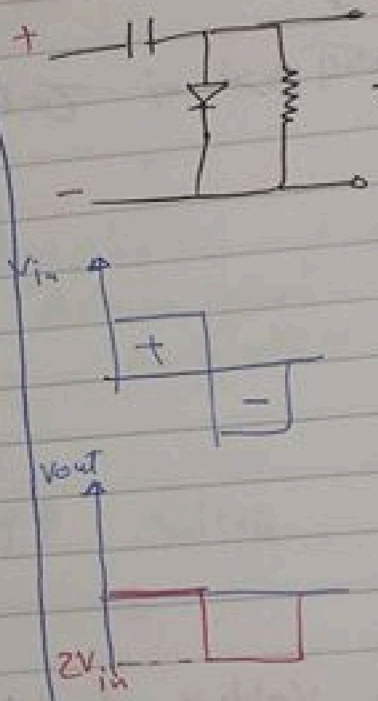




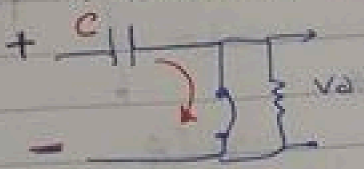
Hi, S

② Clamping :

Clamping يعني في مكثف في الدائرة.

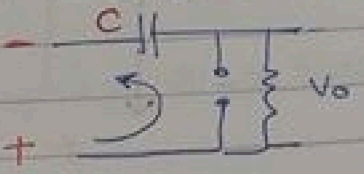


① $V_{in} > 0$ ∴ Diode is on → S.C



∴ V_o = zero

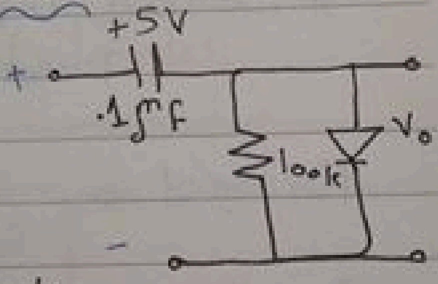
② $V_{in} < 0$ Diodis off → o.c



∴ $V_o = -2\,V_{in}$

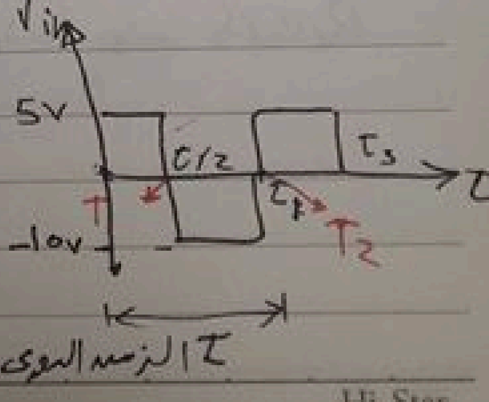
* في حالة ال forward يشحن المكثف في
يصبح $V = V_{in}$

* في حالة ال Revers. يكون الجهد على المقاومة
$2V_{in} = V_c + V_{in} =$



f = 1 KHz = 1000 Hz

$T = \frac{1}{1000} = 1\,m.s$

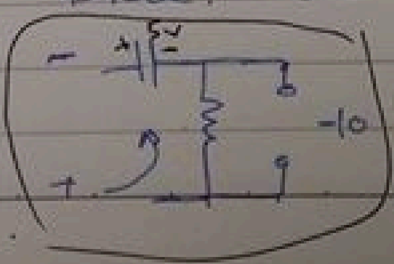


① from $T = 0 \rightarrow T_1$ Diode is S.C

$T_1 = \frac{T}{2} = .5\,ms$

Vout = zero

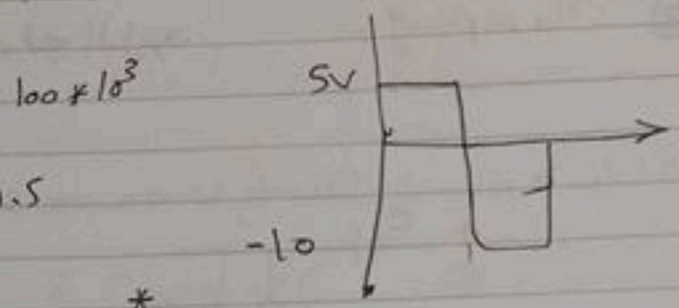
② from $T_1 \rightarrow T_2$ Diode is o.c

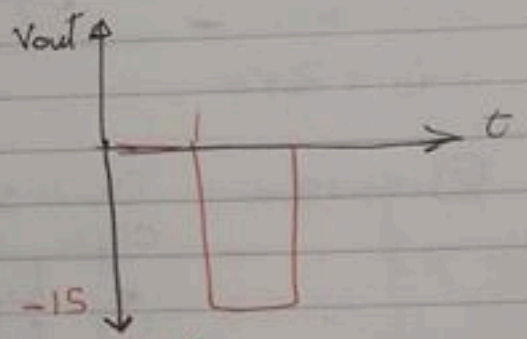


Vout = −15

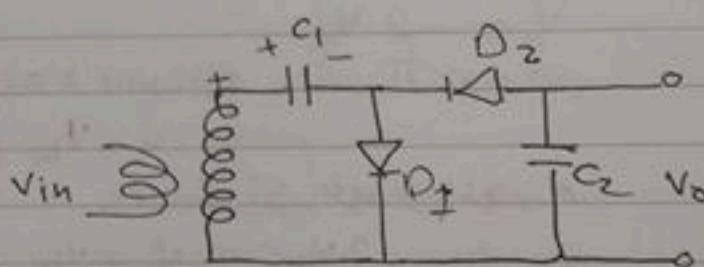
$\tau = RC = .1 * 10^{-6} * 100 * 10^{3}$

$\tau = 10\,m.s$ زمن تفريغ المكثف





(3) Voltage doubler



* Double input with (-ve) sign
Inverted wave.

Forword $\Rightarrow$ $V_{out} = 2\,V_{in}$

Reverse $\Rightarrow$ $V_{out} = -2\,V_{in}$

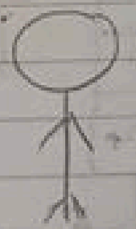
transistor

[1]* Switch مفتاح

off

on
"Saturation"

[2]* Amplifire مكبر
"Active region"
لو عايز كبيرة

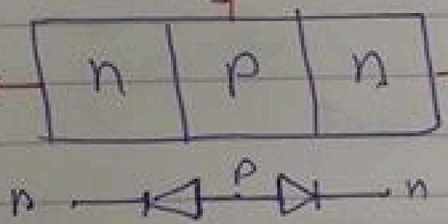


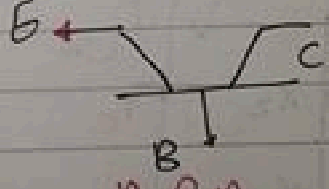
playing → Biasing → ↑↑ Voltage

slep → " ↓↓

B قاعدة Base

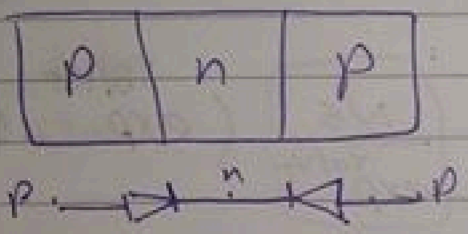
transistor.

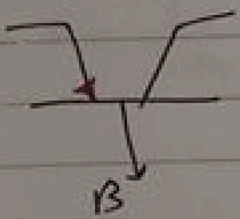
emitter E باعث ←  → C مجمع Collector



n-p-n

Back to Back Diodes



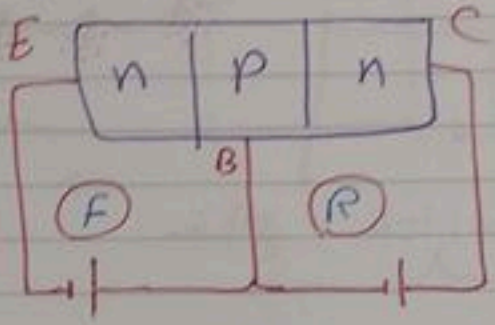


p.n.p

Active transistor

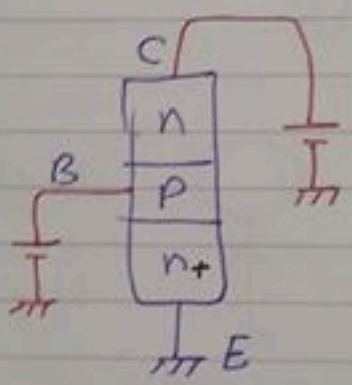
Amplifer

الترانزيستور مجمع



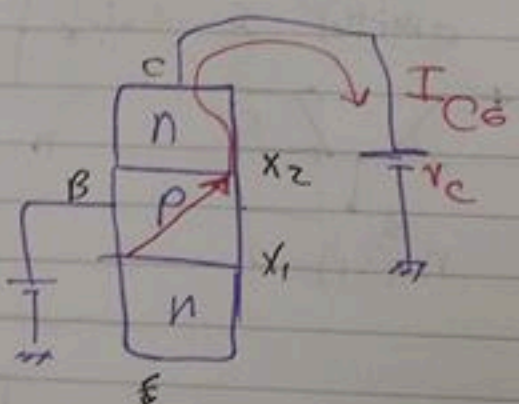
علشان الترانزيستور يشتغل
لازم الـ E يبقى Forward
والـ C يبقى Reverse

100A = تيار Base ⇐



* Collector Current

$$\Delta n(x_1) \propto \left(exp^{\frac{V_B}{KT}} - 1\right)$$



$$\Delta n(x_1) = \frac{N_E}{exp^{x_0/V_T}} \left(exp^{V_B/KT} - 1\right)$$

ثابت التناسب

N_E ⇐ تركيز الشحنات في الـ emitter

$$V_o = V_T \ln\left(\frac{N_A N_D}{n_i^2}\right) \leftarrow \text{Diode}$$

$$e^{V_o/V_T} = \frac{N_E N_B}{n_i^2} \leftarrow \text{Transistor}$$

بالتعويض في المعادلة $\Delta n(x_1)$

$$\Rightarrow \therefore \boxed{\Delta n(x_1) = \frac{n_i^2}{N_B}\left(\exp^{V_{BE}/V_T} - 1\right)}$$

$$J_n = q D_n \frac{dn}{dx} = q D_n \left(\frac{0 - \Delta n(x_1)}{W_B \rightarrow}\right) \quad \text{Base عرض}$$

مساحة القطع

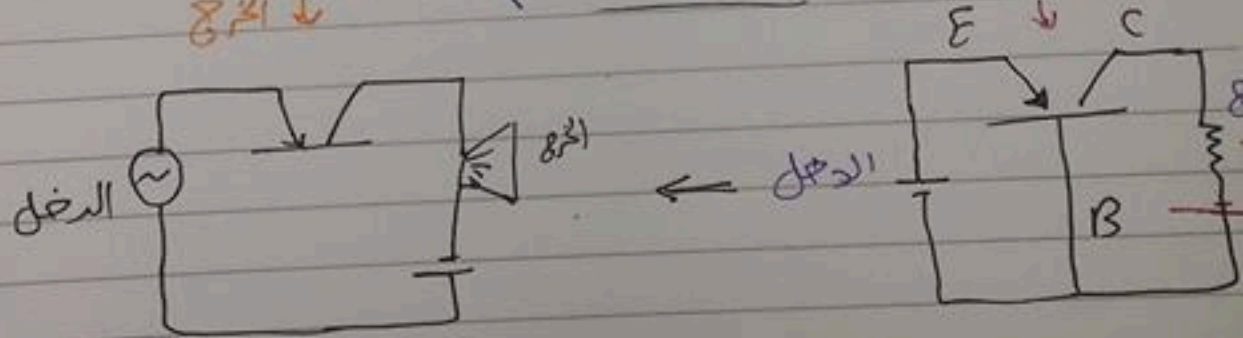
$$I_C = \boxed{\frac{A_E * q D_n n_i^2}{N_B W_B}}\left(\exp^{V_{BE}/V_T} - 1\right)$$

$\boxed{\quad} \rightarrow I_S$

$$\therefore I_C = I_S\left(\exp\left(\frac{V_{BE}}{V_T}\right) - 1\right)$$

القطع ↓

(P-N-P)



$$\text{نسبة التكبير} = \frac{1\ V}{10\ mV} = 1000 \text{ مرة}$$

$1 * V$

$10\ m.V$

$$V_o = V_T \ln\left(\frac{N_A N_D}{n_i^2}\right) \leftarrow \text{Diode}$$

$$e^{V_o/V_T} = \frac{N_E N_B}{n_i^2} \leftarrow \text{Transistor}$$

$\Rightarrow$ بالنسبة للترانزستور

$\Delta n(x_1)$ العلاقة

$$\therefore \Delta n(x_1) = \frac{n_i^2}{N_B}\left(\exp^{V_{BE}/V_T} - 1\right)$$

$$J_n = qD_n \frac{dn}{dx} = qD_n\left(\frac{0 - \Delta n(x_1)}{W_B}\right) \rightarrow \text{Base عرض}$$

تيار التشبع

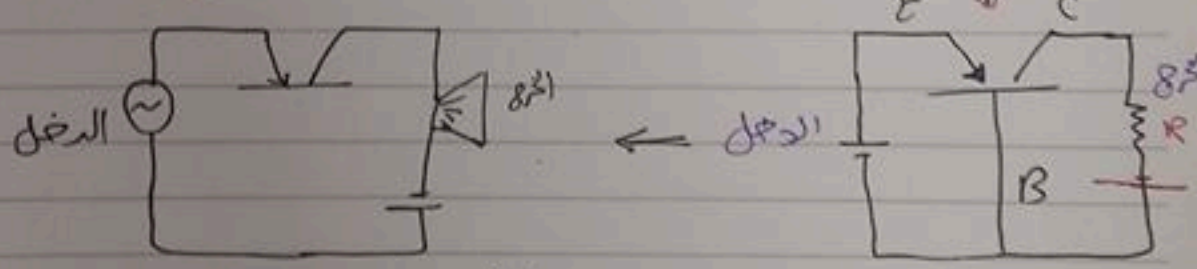
$$I_C = \frac{A_E * qD_n n_i^2}{N_B W_B}\left(\exp^{V_{BE}/V_T} - 1\right)$$

$\downarrow I_S$

$$\therefore I_C = I_S\left(\exp\left(\frac{V_{BE}}{V_T}\right) - 1\right)$$

تيار ↓

(P-N-P)



10 m.V 1 *V

$1000\ * = \frac{1\,V}{10\,mV}$ = نسبة التكبير